

Original Research Articles

Selected elements of general fitness and effectiveness in 1x1 test games among 12-year-old football players

Mateusz Kaczor^{1*}, Henryk Duda¹, Mateusz Korcala²

¹Department of Sports and Recreational Games of the Academy of Physical Education in Krakow, 31-571 Kraków, Poland;

²Hutnik Football Academy Kraków, 30-979 Kraków, Poland

Correspondence: mateusz.kaczor@awf.krakow.pl

Abstract

Background: Individual duels in football are considered a difficult and risky element of the game. Effective actions of a player in a 1x1 situation allow you to gain a numerical advantage over your opponent and gain space on the pitch. The aim of the research is to assess the impact of selected elements of general fitness on the effectiveness of young football players in 1x1 test games. **Methods:** The research was conducted on a group of boys playing football at the "Hutnik" Kraków Football Academy. The group consisted of eighteen young football players born in 2010, who were 12 years old at the time of the study (Youth: D2). The research was conducted in January-February 2022. The method of observation (categorized) was used in the study. To assess the game's disposition, a general physical fitness test and a 1x1 test game were used. **Results:** Based on the correlation analysis, it was found that the general level of physical fitness of young football players has a positive impact on the effectiveness in 1x1 test games. For all analyzed elements of general fitness, significant relationships were found with the 1x1 game indicators. The highest correlations between 1x1 game indicators were recorded for speed, agility, jumping - power of lower limbs and endurance.

Conclusions: In order to increase the effectiveness of the 1x1 game, care should be taken to develop general physical fitness, with particular emphasis on speed and agility.

Keywords: football, 1x1 game, general fitness, motor ability tests

Introduction

Football is classified as a team sport, falling under the category of collective (multi-entity) sports, where individual actions can be distinguished as single-player actions defined as individual, actions performed with the involvement of several players labeled as group actions, and synchronized actions of the entire team, known as team actions (1-3). In team sports, Naglak (4) considers individual actions as fundamental, which, as emphasized by Szwarc (1), define the athlete's excellence, determine the quality of their game, and influence the effective execution of group and team tasks.

Individual actions, while actively opposing the opponent, can be defined as "one-on-one" situations (1x1). According to Szwarc (1), the 1x1 game should be understood as the direct interactions between two players from opposing teams, aiming to achieve conflicting goals within the rules specified by regulations. Engaging in 1x1 play in attack is undertaken to score goals, create situations for goal-scoring, with the intention of controlling the field and/or retaining possession of the ball. On the other hand, "one-on-one" play in

Received: 28.11.2023

Reviewed: 25.12.2023

Published: 14.01.2024

Copyright: This article is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License CC BY-SA 7

(<http://creativecommons.org/licenses/by-sa/4.0/>)

defense involves a player's actions against an opponent with the ball to retrieve it, disrupt their actions, or impede the ball's movement.

The 1x1 game is considered a challenging and risky element of competition, but effective player actions in these situations lead to a numerical advantage for the team, facilitating space acquisition and further gameplay (5-6).

Analyses of football matches indicate that winning teams are characterized by a higher level of effectiveness in 1x1 play (7-8). During matches at the highest level, we observe over two hundred such duels (9-12). It is accepted that high-caliber players can engage in nearly 40 1x1 situations with a favorable win-loss ratio (11), while the best teams exhibit around 50% reliability in the discussed duels (12).

The above information highlights that 1x1 situations constitute a crucial element in football. Therefore, in the training of children and youth, special attention should be paid to the development of skills influencing the effectiveness of actions in "one-on-one" situations. Hence, this study assesses the impact of selected elements of general physical fitness on the effectiveness of young football players in the 1x1 test game.

Objective of the Study and Research Questions

The objective of this study is to assess the impact of selected elements of general physical fitness on the effectiveness of young football players in 1x1 test games, focusing on 12-year-old boys from AP "Hutnik" Kraków. Additionally, to obtain comprehensive information about the group's homogeneity, measurements of basic somatic parameters were conducted, which could, to some extent, influence the results of the conducted research.

Considering the research objective, the following research questions were formulated:

1. Does the level of general physical fitness influence the effectiveness of young football players in 1x1 games?
2. Which of the analyzed motor skills most significantly determine the effectiveness of 12-year-old players in 1x1 situations?

Material and Methods

The study group consisted of football players from the "Hutnik" Football Academy in Kraków. Eighteen boys, aged 12 (born in 2010), participated in the research. These young players were selected from Kraków and its vicinity, actively participating in the First District League of Youth organized by the Małopolski Football Association. The declared playing experience of the participants ranged from 4 to 5 years. Players underwent training sessions 3 to 4 times a week, with each session lasting 90 minutes. The team's head coach held a UEFA A license.

The research employed the method of categorized observation. According to Ryguła (13), this method holds significant importance in controlling the effects of the training process and in sports selection. The fundamental technique of this method involves conducting motor, psychological, physiological, and other standardized measurement tests.

The research was conducted in January-February 2022 at the facilities of the "Hutnik" Football Academy in Kraków: a sports hall (measurements of somatic indicators, general physical fitness) and a football pitch with artificial turf (1x1 test games). At the beginning of the study, somatic measurements and general physical fitness assessments were conducted. Subsequently, players were evaluated in 1x1 test games. All measurements were carried out with the consent of guardians and in the presence of the team's coach. Before conducting the tests, players were familiarized with the procedure for performing all trials. During measurements, participants wore appropriate sports attire and football footwear suitable for the surface. Sessions where general fitness tests and 1x1 games were conducted began with a 15-minute warm-up. All assessments were carried out in

accordance with the instructions, maintaining the unchanged format and sequence, and adhering to basic organizational and methodological guidelines (14-16).

To ensure reliable results, measurements were conducted under conditions of full participant motivation. Each general fitness trial (except endurance) was performed twice, considering the better result. The assessment of effectiveness in 1x1 test games was carried out using a "round-robin" competition system.

Standardized tests and diagnostic tools were employed in the research (14,16). To obtain credible information and check the homogeneity of the study group, measurements of basic somatic parameters were also taken (17): body height, body mass, and BMI index.

Four selected sports-motor tests were used to assess overall physical fitness (Talaga 2004):

- Jump test (lower limb power) - standing long jump,
- Speed trial - 30-meter sprint,
- Agility trial - running around cones,
- Endurance running trial - beep test.

Each trial has specific point norms for the obtained results (Table 1).

Table 1. Point norms - general fitness tests for U12 youth Source: Own compilation based on: Talaga 2004, PZPN 2016.

Rating	Points	Beep Test (Level)	30m Sprint	Standing Long Jump	Running Around Cones	Rating	Points	Beep Test (Level)
Very Good	5	>10.5	5.0 s	180 cm	26.0 s	5	>10.5	5.0 s
Good	4	8.6-10.5	5.2 s	142-179 cm	27.0 s	4	8.6-10.5	5.2 s
Average	3	7.6-8.5	5.4 s	105-141 cm	28.0 s	3	7.6-8.5	5.4 s
Poor	2	6.6-7.5	5.6s	67-104 cm	29.0 s	2	6.6-7.5	5.6s
Very Poor	1	6.5-5.2	5.8 s	1-66 cm	30.0 s	1	6.5-5.2	5.8 s

To assess the effectiveness of individual actions, 1x1 test games were utilized (16). The organization of games followed a "round-robin" system. Results obtained from individual matches provided information on four indicators:

1) The number of points scored in all matches (a player received 3 points for a win, 1 point for a draw, and 0 points for a loss) – this indicator reflects the overall effectiveness in both attack and defense in 1x1 games.

2) The difference between the number of goals scored and conceded in all matches – this indicator informs about the difference in a player's effectiveness in attack and defense in 1x1 games.

3) The number of goals scored in all matches – this indicator informs about a player's effectiveness in attack in 1x1 games.

4) The number of goals conceded in all matches – this indicator informs about a player's effectiveness in defense in 1x1 games.

To address the research questions, the collected data was analyzed using descriptive statistical methods, including arithmetic mean, standard deviation, coefficient of variation, and minimum and maximum values. To calculate the relationships between the examined parameters, the Pearson correlation coefficient was employed (18). The calculations were performed using the computer programs Microsoft Excel 2013 and Statistica 13 by StatSoft.

Results

Considering that individual development levels may influence the results of the 1x1 game, the assessment included the level of somatic parameters (Table 2).

Table 2. Results of somatic parameter measurements

	Mean(average)	Min	Max	Standard deviation	Coefficient of variation
Body height	1.582	1.500	1.670	0.043	2.702
Body mass	48.417	44.000	51.700	2.525	5.216
BMI (Body Mass Index)	19.359	17.570	20.920	0.845	4.364

Based on the results presented in Table 2, it appears that the examined group demonstrated a comparable level in the analyzed somatic parameters. Therefore, it can be assumed that the young players were at a similar stage of biological development, increasing the likelihood of the reliability of the conducted analyses.

To assess the relationships between selected elements of overall physical fitness and the effectiveness of 1x1 play, a correlation analysis was applied. Test probabilities (p-values) are provided beneath the correlation coefficient values (a p-value < 0.05 indicates a statistically significant result). The research results regarding the interdependence of the discussed parameters are included in Table 3.

Table 3. Results of the interdependence between the level of overall fitness and effectiveness in the 1x1 test game.

	Explosive strength: Standing long jump	Endurance running: Beep test	Agility: Zig-zag run	Locomotor speed: 30-meter sprint	Total points from all general fitness tests
Total points in 1x1 games	,6775 p=,002*	,5940 p=,009*	-,7245 p=,001*	-,7563 p=,000*	,8658 p=,000*
Goals scored in 1x1 games	,7197 p=,001*	,4985 p=,035*	-,6012 p=,008*	-,6892 p=,002*	,7566 p=,000*
Goals conceded in 1x1 games	-,5152 p=,029*	-,6126 p=,007*	,6618 p=,003*	,6968 p=,001*	-,8006 p=,000*

Statistically significant correlations (p < 0.05) are marked with an asterisk (*).

The data presented in Table 3 indicates that statistically significant interdependencies ($p < 0.05$) were observed between all the analyzed 1x1 game indicators and overall fitness. These results shaped within the range of moderate, strong, or very strong correlations.

For the first of the analyzed 1x1 game indicators (total points), the highest correlations were found with the level of locomotor speed – "30m sprint" ($r=-0.7563$), agility – "running around cones" ($r=-0.7245$), followed by explosive strength – "standing long jump" ($r=0.6775$), and endurance – "beep test" ($r=0.594$).

Analyzing the indicator of goals scored in 1x1 games, it can be noted that the strongest correlations were observed with the level of explosive strength – "standing long jump" ($r=0.7197$), followed by locomotor speed – "30m sprint" ($r=-0.6892$), agility – "running around cones" ($r=-0.6012$), and endurance – "beep test" ($r=0.4985$).

The assessment of the correlation for the indicator of goals conceded in 1x1 games indicated the following order of interdependencies: locomotor speed – "30m sprint" ($r=0.6968$), agility – "running around cones" ($r=0.6618$), endurance – "beep test" ($r=-0.6126$), explosive strength – "standing long jump" ($r=-0.5152$).

For the goal difference indicator in 1x1 games, the strongest correlations were found with the values of locomotor speed – "30m sprint" ($r=-0.7677$), followed by agility – "running around cones" ($r=-0.6999$), explosive strength – "standing long jump" ($r=-0.6827$), and endurance – "beep test" ($r=-0.6161$).

Analyzing the comparison of individual 1x1 game indicators with the overall fitness score (total points obtained from all general fitness tests), very strong correlations ($p < 0.05$) were indicated – Table 3. Based on these results, it can be suggested that among the surveyed players, the level of overall physical fitness had a significant impact on the results in "one-on-one" test games.

Discussion

Statistics published by FIFA and UEFA from international matches indicate that frequently achieving "small victories" in 1x1 play significantly contributes to the overall success of the team (19). Therefore, this study attempted to identify which elements of physical fitness should be developed to effectively compete in 1x1 situations. The research was conducted on a group of 12-year-old football players (youth) from the "Hutnik" Football Academy in Krakow. Motor skills were assessed through measurements of jump height (explosive strength/lower limb power) – "standing long jump," speed – "30m sprint," agility – "running around cones," and endurance – "beep test" (14). Individual play was assessed using a test game, providing information on 4 indicators in 1x1 situations (20). Additionally, basic somatic parameter measurements were conducted to verify the group's homogeneity, revealing that the examined group was at a comparable level of biological development (21).

In evaluating the interdependencies, the highest relationships between overall fitness and 1x1 game indicators were observed for agility and speed measurements (strong or very strong correlation). Slightly weaker connections for individual play indicators were observed for lower limb power and running endurance (in the range of strong or moderate correlation) – see Table 3.

Comparing the results of our study to works by other authors, similar findings were uncovered in Szwarc's research (22), where positive influences of speed and agility predispositions on the development of "one-on-one" playing skills were observed in players aged 12-15. Paluszek (23) also confirmed a correlation between high-speed predispositions and effectiveness in 1x1 games among 15-year-old football players. Moreover, other studies have revealed that the level of "explosive" strength significantly influences individual play effectiveness (24).

The mentioned research results align with the opinions of experts (25-27), who indicate that dynamic forms of game fragments (including 1x1 situations) are effective tools

for developing speed and speed-strength abilities. In these dynamic forms, the coach has the opportunity to control the exercise intensity and the ratio of effort to rest time. Regarding endurance, our research findings are supported by the work of Jaworski et al. (28), who observed significant correlations between endurance and indicators of the 1x1 test game among players aged 12-13 (as well as older players). It is worth noting that, according to numerous authors (29-32), 1x1 games can be an effective form of endurance training in football player development.

Analyzing the correlations between the total points obtained from individual physical fitness tests and 1x1 game indicators, strong interdependencies are evident (Table 3). Based on these results, it seems that among young football players, a high level of overall physical fitness positively influences effectiveness in 1x1 situations. This is also confirmed by the observations of other researchers (11, 22, 28, 33), according to whom individual game effectiveness is largely conditioned by the overall level of physical fitness.

Conclusions:

- Among young football players, the level of overall physical fitness significantly influences effectiveness in 1x1 play.
- In the examined group, the highest correlations with the effectiveness of 1x1 play were found sequentially for speed abilities, agility, jump height (lower limb power), and endurance.

Practical Implication

- To increase effectiveness in 1x1 play, attention should be given to the development of overall physical fitness, with a particular emphasis on speed abilities and agility.
- In the process of football training, young players should experience numerous situations in a 1x1 setup.

Author Contributions: Authors of this article made the following contributions: Conceptualization, M.K., H.D. and M.K.; methodology, M.K., H.D. and M.K.; software, M.K., H.D. and M.K.; validation, M.K., H.D. and M.K.; formal analysis, M.K., H.D. and M.K.; investigation, M.K., H.D. and M.K.; resources, M.K., H.D. and M.K.; data curation, M.K., H.D. and M.K.; writing—original draft preparation, M.K., H.D. and M.K.; writing—review and editing, M.K., H.D. and M.K.; visualization, M.K., H.D. and M.K.; supervision, M.K., H.D. and M.K.; project administration, M.K., H.D. and M.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Ethical Committee: The study was approved by the Ethics Committee at the regional medical chamber in Krakow number: 42/KBL/OIL/2015.

Informed Consent: Informed consent was obtained from all study participants.

Data Availability: The data presented in this study are available upon request from the corresponding author.

Conflict of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

1. Szwarz A: Piłka nożna. Gra jeden przeciwko jednemu. WM. Olecko. 2008.
2. Grycmann P, Szyngiera W: Nowoczesne nauczanie i doskonalenie gry w piłkę nożną, Katowice, 2016.
3. Duda H: Kształcenie gracza we współczesnej grze w piłkę nożną: podręcznik dla studentów AWF. AWF Kraków. 2022.
4. Naglak Z: Kształcenie gracza na podstawowym etapie. AWF Wrocław. 2010.

5. Żmuda W, Witkowski Z: Edukacja młodych piłkarzy nożnych: technika gry. AWF Katowice. 2015.
6. Grycmann P: Rozumienie Gry. Wyd. Paweł Grycmann, Katowice. 2021.
7. Szwarc A, Kromke K: Zmiany sprawności działania w sytuacji gry jeden przeciwko jednemu piłkarzy nożnych najwyższego poziomu zaawansowania sportowego w zależności od wpływającego czasu gry i wyniku rywalizacji. Rocznik Naukowy AWFis w Gdańsku. 2011, t. 21, s. 23 – 32.
8. Duda H., Brzyski J. Identification of the Efficiency of Football Players in Individual Risky Situations (on the Example of the Polish National Teams Performance in the EURO 2012 Tournament). *Antropomotoryka*. 2016;74, s.63 – 71.
9. Gerisch G, Reichelt M: Computer – and video – aided analysis of football games. (in:) Reilly T, Clarys J, Stribbe A, (ed.): *Science and Football II*, London, EFN SPON. 1993: 167–173.
10. Szwarc A, Kromke K, Radzimiński Ł, Jastrzębski Z: Efektywność gry 1 na 1 dla piłkarzy wysokiego szczebla podczas mistrzostw świata i Europy w odniesieniu do pozycji na boisku i czasu meczu. *International Journal of Sports Science & Coaching*. 2017: 12 (4), 495-503. <https://doi.org/10.1177/174795411771>
11. Panfil R, Żmuda W: Nauczanie gry w piłkę nożną. Wyd. B.K. Wrocław 1999.
12. Szwarc A., Kromke K., Stuła A: Sprawność działania piłkarzy mistrzowskiego poziomu sportowego w sytuacjach gry jeden przeciwko jednemu. (in:) *Vedecké práce KSSaP 2015*. Vedecký zborník / vedec. ed. Marián Merica. Univerzita sv. Cyrila a Metoda. Trnava. 2015
13. Ryguła I: Proces badawczy w naukach o sporcie. AWF Katowice. 2003.
14. Talaga J: Sprawność fizyczna ogólna - testy. Wydawnictwo Zysk i S-ka. Poznań. 2004.
15. PZPN: Nowoczesne testy piłkarskie. Warsztat trenera nr. 13 grudzień 2011. s. 34-39.
16. Ljach W, Witkowski Z: Koordynacyjne zdolności motoryczne w piłce nożnej. COS. Warszawa. 2004.
17. Sobiecki J, Cadel K: Wskaźniki antropologiczne. (w:) *Przewodnik do ćwiczeń z antropologii*, (red.) Gołąb S, Chrzanowska M. Podręczniki i Skrypty nr. 2. AWF Kraków. 2007. s. 19 – 26.
18. Stanisław A. Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny. Tom 1. Statystyki podstawowe. StatSoft Polska. Kraków. 2006.
19. Stępiński M, Dorna M: Gra 1x1 w piłce nożnej – w ataku i obronie. MWW. Wrocław. 2011.
20. Witkowski Z: Symetria i asymetria ruchów w przygotowaniu techniczno – taktycznym i szybkościowo – siłowym piłkarzy nożnych. „Monografie” nr. 21. AWF Kraków. 2013.
21. Kułaga Z, Rózdżyńska-Świątkowska A, Grajda A, Gurzkowska A, Wojtyło M, Gózdź M, Świąder-Leśniak A, Litwin M: Siatki centylowe dla oceny wzrastania i stanu odżywienia polskich dzieci i młodzieży od urodzenia do 18 roku życia. *Standardy Medyczne/Pediatrics*, 2015. t.12. 119 – 135.
22. Szwarc A: Effectiveness in one-on-one games and the level of the selected motorial dispositions in young soccer players. (in:) *Recruitment, Selection and Training of Children and Teenagers in Sports Ball Games*. (red). Żak S, Kłoczek T. Wydawnictwo Monograficzne nr. 9. MTNGS. Wrocław. 2007. s. 109- 111.

23. Paluszek K: Związek pomiędzy skutecznością w grze „jeden przeciwko jednemu” a zdolnościami kondycyjnymi i koordynacyjnymi. [w] Sport dzieci i młodzieży na przełomie wieków. (red.) Bergier J, IWFiS, Biała Podlaska. 2000, s. 129-135.
24. Żak S, Pleszka P, Klocek T: Poziom wybranych zdolności motorycznych i cech somatycznych a efektywność indywidualnej gry młodych piłkarzy nożnych. (w:) Żak S, Spieszny M, Klocek T, (red.) Gry zespołowe w wychowaniu fizycznym i sporcie. Studia i Monografie nr. 33. AWF Kraków. 2005. s. 190 – 196.
25. Verheijen R: Conditioning for Soccer. Reedswain. Spring City. Pennsylvania. 1998.
26. FIFA: Small-sided games and integrating physical preparation, Zurich. 2013.
27. Dost H, Hyballa P, Te Poel H: Soccer functional fitness training. Mayer & Mayer Verlag. Aachen. 2016.
28. Jaworski J, Gargula L, Tchórzewski D, Durlik K, Kołodziej E. Identification Of Somatic And Functional Variables Determining The Effectiveness Of Test Games In Various Football Training Groups. Antropomotoryka. Journal of Kinesiology and Exercise Sciences. 2017. 78 (27): 47-56,
29. Chmura J, Chmura P, Ciastoń J: Przygotowanie motoryczne piłkarzy do wysiłku startowego. Sport Wyczynowy. 2008. nr. 10-12/526-528. s. 49-6.
30. Hill-Haas S, Dawson B, Impellizzeri F, Coutts A: Physiology of Small-Sided Games Training in Football A Systematic Review. Sports Medicine, 2011. 41(3): 199 – 220. doi: 10.2165/11539740-000000000-00000
31. Owen A, Dellal A: Football conditioning a modern scientific approach: fitness training, speed & agility, injury prevention. SoccerTutor.com. 2016.
32. Kryściak J, Tomczak M, Podgórski T, Chmura P, Konefał M, Chmura J, Maly T, Modric T, Andrzejewski M: Temporal changes in intensity and volume of external training loads during a 1 × 1 short-bout, small-sided games in elite youth soccer players. Scientific Reports. 2023. 13. 10.1038/s41598-023-45277-y.
33. Duda H, Kaczor M, Ambroży T: Intelktualizacja jako wymóg kreatywnego nauczania gry młodych piłkarzy nożnych, (w:) Stuła A. (red.), System szkolenia piłkarzy w wybranych krajach i klubach europejskich. Badania wspomagające efektywność szkolenia w Polsce. Politechnika Opolska. 2014. s. 102 – 116.